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Science & Technology

Central Eurasia

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Science & Technology

Central Eurasia

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5 October 1994

NOTE TO READERS: Effective 1 October, the processing indicators appearing in brackets at the start of each item will be changed. All new indicators will begin with "FBIS" to make the material more easily identifiable. Some will also indicate whether the item has been translated from the vernacular or transcribed from English.

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**Russian Parliament Committee Discusses
Microelectronic Industry**

947A0061A Moscow DELOVOY MIR in Russian
30 Jun 1994 p 1

[Article by DELOVOY MIR correspondent Moisey Gelman under the rubric "Conference: The Problems of Electronics at the Round Table"]

[FBIS Translated Text] On the initiative of the Duma Committee on Industry, Construction, Transportation and Communications, the Ministry of Defense, and the newspaper DELOVOY MIR a round table on urgent problems of the electronic sectors and instrument making was held in the State Duma.

It would be comparatively easy under normal conditions to solve the problems of the technological integration of microelectronic production. But in the present crisis the technological disunity of the enterprises, which produce hardware and microcircuits, is aggravating the decline of the production of electronic equipment. The state orders for it, which are substantially less as compared with last year, are being financed as worse as can be, while the effective demand on the consumer market is obviously inadequate for the survival of the electronic sectors.

The conference participants discussed the following questions:

- Do we need to import microcircuits or to develop our own production;
- How is one to integrate the design and production of domestic electronic equipment;
- How should the problems of the production of specialized, for the tasks of the users, and general-purpose microcircuits be solved and how is one to take into account in this case the specific nature of military equipment;
- How is one to restore and modernize the domestic technological base, where is one to get the assets for this, and is it necessary in this case to restore the former cooperation;
- What is to be done with the personnel for the integrated processes of the design and production of various electronic equipment;
- Is the integration of the present main administrations of the electronic sectors and machine building into a single federal coordinating body, which ensures indicative management, necessary?

A big discussion developed over the problem of the restoration and development of the domestic consumer market.

First Deputy Minister of Defense A.A. Kokoshin:

V.K. Gusev, chairman of the Committee for Industry of the State Duma;

Yu.A. Kirpichnikov, editor in chief of the newspaper DELOVOY MIR;

the heads of main administrations of the Russian Federation Committee for Defense Sectors of Industry: A.S. Andreyev of the Main Administration of the Electronics Industry and A.V. Yakovlev of the Main Administration of the Radio Industry;

A.N. Voldorin, deputy chairman of the Committee for Machine Building;

Yu.N. Dyakov, president of the Nauchnyy tsentr Scientific Production Complex of Zelenograd;

Ya.A. Fedotov, head of a chair of the MIREA;

V.M. Proleyko, director of the Kompyuterlink State Small Business;

A.N. Shulunov, director of the Central Scientific Research Institute of Radio Engineering and president of the League for Assistance to Defense Enterprises;

V.G. Nemudrov, director of the Scientific Research Institute of Microelectronic Equipment;

V.A. Salishchev, chief of a division of the Scientific Research Institute of Space Instrument Making;

and Ye.I. Arkhipov, president of the YeVAR Scientific Production Center, participated in the conference.

At the suggestion of DELOVOY MIR the round table will acquire the status of a public expert organ attached to the Duma Committee for Industry.

The problems discussed in greater detail will be examined in one of the next issues of the weekly DELOVOY MIR.

**Decline in R&D Affecting Russian
Competitiveness**

947A0061B Moscow DELOVOY MIR in Russian
4-10 Jul 1994 p 12

[Article by Fedor Glisin and Georgiy Ostapovich, the Center for Economic Conditions attached to the government of the Russian Federation, under the rubric "Economics: If There Are No Science and New Technologies, Do Not Expect a Competitive Product"—first two paragraphs are DELOVOY MIR introduction]

[FBIS Translated Text] The innovation activity of industrial enterprises is scientific research, planning and design and experimental design work, scientific and technical services, other types of scientific and technical activity, as well as the introduction of the results of research and development in the sphere of production and management.

The Center for Economic Conditions conducted during the first quarter of 1994 the next sample survey of the innovation activity of industrial enterprises of Russia. About 1,400 executives of enterprises of 11 sectors of industry from 30 regions of Russia participated in it.

The results of the survey attest: As compared with the third quarter of 1993 no improvements occurred in the innovation activity of enterprises. On the contrary, this work, judging from the responses of the executives, has been performed in 1994 at only 41 percent of the enterprises, which is 6 percentage points less than during the third quarter of 1993. Moreover, at the majority (56 percent) of enterprises it is also not planned during the second quarter of 1994. Six out of every 10 enterprises that participated in the survey are not developing new types of products and technologies, are not providing scientific and technical services, and do not envisage this activity in the immediate future.

Thus, not only the volumes of production, but also its scientific and technical level are continuing to decline, which in turn is adversely affecting the production cost and quality of a product, its competitive ability, and the sales volumes.

As before the share of enterprises, at which scientific research is being conducted, is very small (3 percent). As compared with the third quarter of 1994 it has decreased.

Planning and design and technological activity (29 percent of the enterprises), which makes it possible to develop innovations on the basis of the scientific reserve, among which there are also the most prevalent type of innovations, remains the most prevalent type of innovations.

The number of industrial enterprises (11 percent), which are conducting pilot and experimental operations, is small, which is having an adverse effect on the quality of the innovations being developed and introduced. Indirectly this also attests to their low scientific and technical level—fundamentally new types of technology, equipment and products require a large amount of pilot and experimental operations. The share of enterprises that are rendering scientific and technical services is negligible—only 3 percent of their total number.

The fact that innovation activity at enterprises, as in 1993, is being carried out mainly on their own, also attests to the insufficiently high level of scientific and technical work in industry. This also applies to small enterprises which do not have the necessary equipment for these purposes. Only 8 percent of the enterprises use the services of outside scientific research organizations for the development of innovations. Consequently, sectorial science is practically not obtaining orders from enterprises of industry, which under the conditions of the reduction of budget financing is decreasing more and more the scientific and technical level of production in the sector.

Innovation activity at enterprises of different types of ownership has its typical features. Its greatest activeness is observed at joint-stock enterprises of the closed type (52 percent of the surveyed respondents). State enterprises have yielded their positions somewhat. The share

of those conducting innovation activity among them has decreased from 43 to 37 percent.

It is typical that only state and joint-stock enterprises of the open type planned to expand innovation activity during the second quarter of 1994. Enterprises of other types of ownership (leased enterprises, joint-stock enterprises of the closed type, limited liability partnerships and others) are not planning to step up innovation activity.

There are no differences among enterprises of different types of ownership in the directions of innovation activity. Joint-stock enterprises of the closed type are conducting scientific research work a little more (5 percent) than on average for the sample (3 percent), while leased enterprises are not engaging in it at all.

Planning and design, technological, as well as pilot experimental operations take up the bulk in the innovation activity of enterprises. Joint-stock and state enterprises are also most active in this. They, for the most part, are cooperating with outside scientific research organizations.

Innovation activity at leased enterprises is organized most poorly. It is typical that the surveyed leased enterprises did not use at all during the first quarter budget assets for innovation activity.

Enterprises of all forms of ownership are placing the main emphasis on the practical implementation of innovations, while in the sphere of management—on computerization. Innovations on the automation of production and the introduction of new means of contact and communications.

As a whole, as the analysis of the results of the survey showed, only joint stock enterprises of the closed type are maintaining the positions in the level of innovation activity as compared with the third quarter of 1993, the rest have surrendered them somewhat.

Innovation activity is most active in ferrous (75 percent) and nonferrous (72 percent) metallurgy. It is somewhat lower in the chemical industry (65 percent) and machine building (53 percent).

Enterprises of the indicated sectors are also more interested in stepping up innovation activity in the future. Thus, 87 percent of the enterprises of ferrous metallurgy, 83 percent of the enterprises of nonferrous metallurgy, and 70 percent of the enterprises of the chemical industry planned innovation activity during the second quarter of 1994. In other sectors the share of enterprises that are carrying out innovation activity comes to less than 40 percent.

The lowest indicators remain at enterprises of the timber industry (25 percent), the food industry (30 percent) and the construction materials industry (35 percent). Here it is also not planned to step up innovation activity substantially in the future. The directions of innovation

activity are also differentiated by sector. Thus, whereas in nonferrous metallurgy the share of enterprises (33 percent) that are performing applied scientific research work is quite high—it exceeds by 4 percentage points the level of the third quarter of 1993, in the chemical industry the share of such enterprises has decreased by 14 percentage points and comes to only 13 percent, in the fuel industry it comes to 7 percent, in the printing industry—6 percent, while in the remaining sectors it does not exceed 3 percent.

At the surveyed enterprises of several sectors scientific research is not being conducted at all. These are ferrous metallurgy, the timber industry and the flour industry. The share of enterprises that are conducting scientific research in machine building decreased from 10 percent in 1993 to 3 percent in the first quarter of 1994. This will adversely affect the level of the scientific preparation of production and will complicate the changeover to new technologies and competitive types of products not only in machine building, but also in other sectors of production.

In all sectors of industry planning and design work and technological operations continue to remain the most significant direction in the overall cycle of innovation activity. The greatest share of enterprises that are performing design work is in ferrous (56 percent) and nonferrous (50 percent) metallurgy, the chemical industry (54 percent) and machine building (43 percent). In these sectors enterprises that are conducting pilot experimental work constitute a large share. In ferrous metallurgy it is 38 percent, in nonferrous metallurgy—28 percent, and in the chemical industry—26 percent. Although one-third to one-half as many enterprises are engaged in pilot and experimental work as compared with the number of enterprises that are performing planning and design work and technological operations. This once again testifies that the design work being performed for the most part is connected with the improvement of traditional technologies and the modernization of operating units and equipment, which do not require the conducting of scientific research and experimental design work, which cannot affect fundamentally the increase of the technical level of products and the quality of goods.

A typical feature of innovation activity both at enterprises of industry and in the majority of the most science-intensive sectors is the fact that research is conducted mainly on their own. Without the enlistment of specialized scientific research organizations.

Mainly enterprises of nonferrous (50 percent) and ferrous (44 percent) metallurgy, the chemical industry (19 percent) and the fuel industry (17 percent) use the services of outside researchers. For the enterprises of other sectors this indicator is significantly lower.

The formed state of affairs with the scale of innovation activity and with its scientific and technical level in various sectors of industry is determined first of all by whether the enterprises have their own funds for

research and development. Budgetary sources for the financing of innovation activity are being used mainly in machine building (8 percent), the fuel industry (7 percent), and the printing industry (6 percent), as well as in ferrous metallurgy (6 percent).

Credit and borrowed funds are being used most actively by enterprises of ferrous metallurgy (38 percent of the respondents), machine building (26 percent) and the chemical sector (22 percent). The enterprises of other sectors are using this source of financing considerably less—from 3 to 17 percent.

In the majority of sectors of industry the main direction of innovation activity in the sphere of production is the introduction of new technologies and the improvement of operating ones. The greatest activity has been identified in nonferrous and ferrous metallurgy, as well as in the chemical industry.

In the printing industry the introduction of new technical and organization services has become prevalent, while in the flour industry the introduction of new types of products has become prevalent, which to a considerable extent is connected with their technological and production specifics.

In the sphere of management the enterprises of ferrous metallurgy and the chemical industry are displaying the greatest innovation activity. Steps on computerization hold first place in these sectors. At enterprises of nonferrous metallurgy the activity on the introduction of new means of contact and communication is observed to be significantly higher (17 percent) than on the average for the sample (5 percent).

The tendency toward the independence of the innovation activity of industrial enterprises from their size, which to a significant extent determines the economic possibilities of investing funds in innovations, remains. Thus, the share of enterprises conducting innovation activity increases from 23 percent among small enterprises with less than 200 people to 74 percent in the group of the largest enterprises with more than 5,000 people. Only large enterprises with more than 1,000 people are conducting applied scientific research (8 percent of their total number). As for small and medium-sized enterprises, among them 1 percent of the installations are conducting scientific research work. There is also a similar trend in other directions of innovation activity (planning and design, technological, and pilot experimental operations, scientific and technical services and other types). The larger the enterprises are, the larger among them the share of the ones carrying out innovation activity. This also concerns the enlistment of outside scientific research organizations.

Hence it is possible to conclude: Large enterprises under the conditions of the economic crisis are continuing to retain certain financial opportunities for research and development and for the updating of the production apparatus and products.

Large enterprises have more opportunities in the use of credit resources for the conducting of innovation activity. Thus, 28-33 percent of such enterprises used credits of banks, while respectively 9 and 16 percent of small and medium-sized enterprises did.

At all enterprises the basic item of innovation in production is the introduction of new technologies and the improvement of operating ones, while in the sphere of management it is computerization.

By maintaining poor innovation and investment activity of Russian industry and increasing with time the wear of the active part of the fixed production capital, it is impossible to expect in the foreseeable future that a competitive product of the processing sectors will appear, as well as the processing and completeness of the use of raw materials in the extractive sectors of industry will improve.

Financial-industrial groups, which are called upon along with the stabilization of production to form adequate investment resources for the maintenance of the scientific industrial potential, should become one of the priority steps on the support in 1994 of innovation activity.

Ukraine's 'Critical Technologies' Policy Outlined

947A0064A Kiev URYADOVYY KURYER
in Ukrainian 2 Jul 1994 p 7

[Andriy Chyrva's interview with Vasyl Lukomskyy under the "Science and Education" rubric: "Critical Technologies As Way Out of Grave Situation"; first paragraph is URYADOVYY KURYER introduction]

[FBIS Translated Text] How soon will the resource-rich Ukraine get out of the situation she has found herself in? This question bothers everybody but babies. The experience of all countries that, as did the legendary Munchausen, pulled themselves by their hair from a swamp indicates that modern technologies are the secret of their economic miracle. These technologies yield high profits either by themselves or through products made using them. Slightly more than a year ago the State Service on Problems of Special Information and Critical Technologies was organized in Ukraine. High hopes rest on the Service. Our reporter has met Service Head, Candidate of Technical Sciences, Actual Member of the Academy of Technological Sciences of Ukraine Vasyl Lukomskyy.

- What did you personally, Vasylyu Grygorovychu, put into the "critical technologies" concept?

Indeed, everything is in technologies—people's well-being, national security, State's place in the world community and the degree of its independence. There are realities behind worn-out words "Ukraine has tremendous S&T potential". According to UNESCO it is here that about seven percent of the world's potential has been accumulated. The State has created a certain technical resource which, if used correctly and smartly, will yield substantial results.

The experience of developed countries demonstrates that they were taking the route of selecting from the entire mass of technologies those that were the most prestigious for a given country at a given time. As far as Ukraine is concerned these are technologies that in the case of tomorrow's negligent attitude will lead to a critical situation in main branches of the national economy and in life support of State's population.

- Please name, if possible, several examples of critical technologies. What is their route with respect to your Service?

Ukraine is one of six countries that have the so-called arsenide-gallium technology. At the time huge amounts of money was invested in equipment and personnel training. The important thing is that the chain of manufacturing state-of-the-art semiconductors is closed, i.e. Ukraine has everything necessary to enter the world market with her products. And the world market orients itself at this very technology because it constitutes a qualitatively new direction in electronic instrument building. If we squander the opportunity and scatter the developments and personnel, there will be no way back. The problem is interbranch in character and we have concluded that it is this very technology that is critical.

Another example. Airplanes, ships, missiles and torpedoes cannot exist without inertial navigation systems based on gyroscopic instruments. The latter are based on gyrotechnologies. These are extremely science-intensive products, and it so happened that mainly Russia, Ukraine and Byelorussia were jointly competing with advanced countries in developing these instruments. Currently we are expanding the space exploration program, aircraft building and shipbuilding, where one cannot do without gyrotechnologies. So much the more that we again have everything - S&T (KPI [Kiev Polytechnic Institute]) and industrial (Association "Arsenal", automatic equipment manufacturing plant imeni Petrovskyy, "Photoprylad", NVO [scientific production association] "Khartron") potential. We have studied the situation and everything boils down to the fact that Ukraine will be able to manufacture certain classes of state-of-the-art gyroscopic instruments.

So our Service in cooperation with scientists and industry professionals must identify such technologies and then protect them and get financing from State and other sources, which is what is being done now.

- Your agency is about the youngest and was organized on the wave of market transformations. But which route have you chosen - rigid administration or something else?

One should by no means aim at rigid administration. Nor can one only rely on budget financing. We are therefore attracting small and medium businesses and foreign investment and planning creating a fund for development and protection of critical technologies. The fund will have various sources - both State and private,

when we will get money by implementing the technologies and selling products, as well as business sources.

In doing this one should take into account the experience of USA and other countries where every year the list of critical technologies is updated and reported to the President and government in order to get additional financing.

So we are an organization that uses various management forms and methods to facilitate the development and protection of critical technologies that as a rule are interbranch in character, using financial, legal, information and organizational and technical measures.

- Quite a few organizations in the State are involved in science and technologies. What is your Service's place?

Our Service has its own specificity. Its activity is focused on ensuring State sovereignty and security in the national economy and military spheres. One of directions of its activity is integrated development and protection of critical technologies. Not as Service Head but as a professional I am convinced that in the sphere of S&T activity critical technologies are a special link that should be given proper State attention. The course for timely development and - the most important thing - implementation of these technologies is the main factor that has effect on meeting national requirements such as improving the quality of life, economic competitiveness, energy independence and ensuring the defensive capacity of the State. It is therefore very important to choose the technologies on the development and implementation of which to concentrate State-scale effort. This will make it possible for Ukraine to get out of the crisis situation.

Of course the State Committee on Problems of Science and Technologies is the head structure that implements the general S&T policy. Now the Committee has been reorganized; it includes heads of various agencies involved in S&T activity, including me as Derztekhninformsluzhba [State Service on Problems of Special Information and Critical Technologies] Head. But I repeat: critical technologies must be separated as is done in many advanced countries.

- But there is some skepticism: you intend to systematize and protect the most state-of-the-art technologies. But they have wandered abroad via various routes, and for measly a dollar at that. So what is there to protect?

With all responsibility I am declaring that at present there is something to protect. In science and among engineers there still are devoted people and enthusiasts and there are quite a few ideas. There is industry, although in a crisis; it is alive and ready to rev up - provided there is a smart approach. Data banks and studies of the situation by our specialists indicate that not all is as bad as it seems. But one should hurry because tomorrow can be late.

Objective selection of such technologies is a different issue - here expert examination is needed. We have asked the Academy of Technological Sciences and agencies to share with us their experience in the area of expert examination. The Service developed regulations for expert examination, has studied each specialist and determined his or her competence. Unfortunately the situation is such that it is fairly difficult to ensure objective examination. I think considerable scientific research work is needed to create a national expert examination system and define the criteria.

- There are two schools of thought. One is that critical technologies is the internal business of the State and that they must lift Ukraine. Another one - bring them to the world market, sell and compete. Whose side are you on?

There must be an integrated approach on a case-by-case basis. See, despite the fact that we have quite a few high technologies, nobody is specifically looking for us in the world market; it is not that easy to sell these technologies. At what price? How to do it most profitably? One should be also taking into consideration problems of national security, probable expenses in selling the technologies and compare the expenses to sales revenues etc. There is a more acceptable way - use critical technologies to manufacture products and sell the products abroad.

- Do you feel sufficient support on the part of the State?

Yes. The Government approved important resolutions aimed at ensuring accomplishment of tasks the Service is charged with. Thus, this past May the Cabinet of Ministers approved the concept of organizing the State system of development and protection of critical technologies that was developed by Derztekhninformsluzhba, approved the National Program of Ukraine "Critical Technologies" and the statute of the mechanism for its development and implementation, and a number of other documents. There is a lot of work ahead, and the results depend on solving problems of financing on the part of the Ministries of Economy and Finance, and on the level of organizational work of the Service and all interested Ministries, agencies, scientists and specialists.

The interview was conducted by Andriy Chyrva

China 'Organizes Brain Drain' From Russia

947A00664 Moscow NEZAVISIMAYA GAZETA
in Russian 11 Aug 1994 p 6

[Article by Rodion Nikolayev under the rubric "Cooperation?: 'Profitable' Deals With an Eastern Neighbor. China Displays Increased Interest in Russian Scientists"]

[FBIS Translated Text] NEZAVISIMAYA GAZETA has already written about the financial problems of domestic science and the difficulties of cooperation of Russian scientists with western partners, which at times costs us too much. Let us now make a 180 degree turn and

examine analogous problems that are arising in our relations with eastern neighbors. Let us take for an example the People's Republic of China.

The decrease of budget financing of Russian science, the growth of commercial sentiments, and the relaxation of state control have led to the expansion of the range of scientific and technical exports. It is now possible to acquire many types of technologies in Russia, just as in other countries of the CIS, for one-third to one-half as much as on the world market. For example, in 1992 China bought from the Kharkov Machine Building Plant grinding equipment for \$250,000. The same American equipment, with the same technological parameters costs about \$2 million. Some instruments, especially in remote areas of Russia, are even less expensive than on the domestic market of China. And the transportation costs are low. Thus, blasting chambers of the Siberian University cost \$7,000, similar Chinese devices cost about \$100,000.

According to the estimates of experts, such a "favorable" situation for the eastern neighbors of Russia will last another three to four years, and it is a sin not to use it 100 percent. The "Asian tigers" are establishing powerful centers for the gathering of information on the scientific research activity of Russian scientists and on the most promising researchers. Stocks of inexpensive consumer goods are being mobilized for barter deals of the "our shorts for your rockets" type. Special commercial scientific offices, which have tax credits for contacts with Russian scientific research institutes and enterprises of the military-industrial complex, which are growing poor, are being organized. The questions of potential foreign exchange credits not only for organizations, but also for individuals, who are willing to deliver needed military products from Russia to the PRC, are being openly discussed. Particular attention is being devoted to the exchange of specialists, especially in the area of aircraft and rocket building. They are being invited on the most preferential terms to give lectures and to participate in experiments.

It should be noted that it does not upset the Chinese side when these invitations are made with gross violations of the legislation of Russia. It is worth it: The Chinese remember perfectly well the situation of the 1950s and 1960s, when due to political coolness the military hardware purchased in the USSR had no spare parts and service personnel, therefore, the path of purchasing separate specimens, assemblies or blocks of military hardware with the subsequent invitation of specialists from Russia for the unlicensed placement into production of ostensibly their own item was recognized as most promising.

In 1992 specialists of the Soyuz LNPO were invited privately to assist in the production of powders for solid-propellant rockets. In 1993 China attempted to acquire in circumvention of established regulations individual assemblies of the Mir and Salyut space stations, Mig engines, and so on.

If they do not succeed in coming to an agreement with various Russian foreign tradesmen, who are competing with each other, they try to go directly to producers and developers and to tempt them with "profitable" deals. Chinese representatives, who come with tempting proposals, are displaying irrepressible curiosity in enterprises of the military-industrial complex, and their questions often go beyond the agreed goals of the visit. In turn defense personnel, who are inexperienced in diplomatic and commercial tricks and are interested in supporting their vital activity, tell foreign visitors what they absolutely ought not know.

In 1993 a Chinese delegation, which, in words, wanted very much to purchase SU-30K aircraft with the corresponding licenses for their production, visited on three occasions the Irkutsk Aircraft Production Association. In reality the members of the delegation were more interested in unofficial information about the technology of producing this type of aircraft, the materials used, and the fine economic and organizational points of its development. Such gathering of unofficial information in some places is called industrial espionage and is prosecuted very severely by some state agencies. Similar incidents occurred at the radio engineering plant in Krasnoyarsk and at the Siberian Aerospace Academy.

The government and Ministry of Foreign Affairs of the Russian Federation, not wishing, apparently, to distress their great neighbor, are reacting sluggishly to such facts and obviously are marking time in matters of the conclusion of special agreements with the PRC on the protection of intellectual and industrial property.

Ad Seeks Russian Nuclear Scientists for Third World Countries

947A0066B ATOMNAYA ENERGIYA in Russian No 5, Apr 1994

[Advertisement]

[FBIS Translated Text] Western multinational companies are seeking consulting specialists in various areas of engineering and specialists in technical training and management for work on projects in Africa, South America, and the Near East.

Candidates should have the experience of at least one long period (or several short periods) of consulting work and technical working in countries from the above-mentioned regions during the last five years.

We asked interested individuals to send a complete questionnaire, which includes age, level of education, professional work experience, details on the ability to use foreign spoken languages, as well as an address and telephone number to the address:

109443, Russia, Moscow, a/ya No 31.

CHEMISTRY

Ground Spectrometric Measurements in the Thermal Range for Lithologic-Geochemical Studies

947M0087B Moscow GEOKHIMIYA in Russian No. 2, Feb 1994 (manuscript received 18 Nov 1992) pp 299-303

[Article by V.G. Surin and I.O. Smirnova, Cosmoaerologic Methods Scientific Research Institute, St. Petersburg; UDC 550.42]

[FBIS Abstract] One way of increasing the efficiency of geochemical operations related to geological prospecting and ecological problems is to develop new research methods in general and remote methods in particular. Especially promising on this plane are the infrared and thermal ranges, which is where the "resonance" absorption bands of the main ore-forming minerals (silicates, carbonates, sulfates, nitrates, and phosphates) are located. Ground (field) spectral studies, which permit detailed verification of the results of remote observations, optimization of the selection of the pickup channels of remote equipment, and selection of suitable photography conditions are an important component in the system of multizonal aerospace photographs. To support such studies, the All-Russian Cosmoaerologic Methods Scientific Research Institute has developed a kit of equipment that includes an SRP-8/14 field spectrometer of the 8-14 μm range and stand (absolutely black body) for energy calibration of the spectrometer. The spectrometer is equipped with a device to automatically register readings and record them onto a magnetic carrier based on a type BK 0010 PC and with a data processing device and set of applications programs to permit calibration of equipment and processing of results under field conditions. An original method was developed for use with the equipment. The method and equipment were tested in the desert regions of Western Uzbekistan within the confines of the Chardzhou oil and gas-bearing region of the Amu Darya synclise. Spectrometric measurements were taken in 1991 at different times of the day in two profiles. The tests confirmed that the proposed thermal spectrometry method and equipment make it possible to take contactless (remote) measurements at distances up to 200 m, detect small changes in mineral composition even in the presence of a significant "background" (under favorable conditions, the method has a resolution of one percent with respect to SiO_2 , given a total background of 70 percent by volume), and simultaneously determine characteristic mineral associates (silicates, carbonates, sulfates, and phosphates) with no restrictions as to the atomic weights of elements (which are an issue when x-ray radiographic methods are used). The tests further established that the following steps will be required before the method can be used in actual practice: expand the operating range of the SRP-8/14 spectrometer so as to encompass the range of the spectrum from 2 to 14 μm , create a system of standard radiation samples to permit field calibration

for specified groups of minerals directly before measurements are taken, formulate a base of spectral data and use the said data as comparison standards, and develop methods of measuring atmospheric back radiation and true emissivities. Figures 3; references 8: 4 Russian, 4 Western.

Gold Crystallization Processes in Quartz-Adularia Associations (Based on Natural and Experimental Data)

947M0085B Moscow GEOKHIMIYA in Russian No. 5, May 94 (manuscript received 6 Aug 93) pp 760-767

[Article by M.S. Sakharova, S.K. Ryakhovskaya, and M.Ye. Uspenskaya, Moscow State University, UDC 550.4:549.283+549.651.11]

[Abstract] Data from a study of natural gold-adularia-quartz associations from the Okhotsk-Chukot volcanogenic belt were analyzed along with the results of an experimental study of processes of gold deposition in adularia and quartz under hydrothermal conditions. The experiments were conducted in accordance with the autoclave method at temperatures ranging from 100 to 200°C and with 10% HAuCl_4 serving as the gold-bearing solution. The deposition was performed on plates of natural minerals that had been placed on the bottom of a fluoroplastic insert in the autoclave and then had working solution poured over them. The autoclave was 70 percent filled. The amount of gold deposited during the experiments was determined on the basis of its loss from the solution by atomic adsorption analysis before and after the experiments. The experiments lasted between 3 and 18 hours each. The morphology and distribution laws of the gold particles on the surface of the adularia and quartz were studied by scanning and transmission electron microscopy. The effect of Na and K ions on deposition was studied by adding sufficient amounts of solutions of 0.1N KNO_3 and 0.1N NaNO_3 to the autoclave. A total of 70 experiments were conducted. The experiments confirmed that adularia and quartz in gold-containing hydrothermal systems may serve as solid mineral media capable of collecting native gold. The accumulation of gold on the said minerals was concluded to result from reactions of the gold-containing solution with the active segments of their surfaces that are in turn caused by the predominant yield of dislocations (adularia and quartz) and the presence of structural correspondence (quartz). The possible influence of sorption and other factors was not discounted. The process of deposition of gold onto adularia and quartz was found to be staged. In the first stage (i.e., during the first 3 hours of the experiments), flattened round, triangular, and hexagonal gold crystallites measuring less than 10 μm in size analogous to natural fine gold were observed to have formed. Farther along into the experiment, the solitary flattened crystallites were replaced by twin and, more infrequently, triplet coalescences of correct and truncated hexagonal and triangular flat crystals. Complex dendritic flat and three-dimensional rod-shaped monocrystals concentrated near the crystallites of the initial

nucleations were observed 12 to 18 hours into the experiments. Temperature affects the nature and size of the gold crystallites. At 150°C, the crystallites of the initial nucleation reached sizes up to 20 µm, which was 5-7 times the size reached at 100°C. Three hours into the experiments conducted at 150°C, segments with the association of particles of at least two nucleations appeared. No similar phenomenon was observed at 100°C. In general, the crystals become more complex over time. The experiments also established that in the early stages of gold deposition, it is the nature of the mineral on whose surface the process is occurring that dictates the gold's distribution and morphology. In subsequent stages of the process, it is crystallization of gold on the previously deposited gold crystallites that is most important. The similarity between the morphology and characteristic features of the localization of the gold produced during the experiments and those of natural gold deposits was said to explain the nature of finely dispersed gold in quartz-adularia aggregates. Figures 7, tables 1; references 7 (Russian).

CHEMICAL INDUSTRY

Heat Conduction of Diamonds Synthesized on the Basis of the Isotopes ^{12}C and ^{13}C

947M0078A Kiev SVERKHTVERDYYE MATERIALY
in Russian No 1, Jan-Feb 1994 (manuscript received
3 May 1993) pp 70-71

[Article by G.S. Karumidze, Stable Isotopes Scientific Research Institute, Georgia; UDC 536.2:549.211]

[FBIS Abstract] Anthony et al (1990) have stated that the heat conduction of synthetic diamonds containing 0.07 percent ^{13}C equals 3,400 W/(m x C). Ositinskaya et al. (1992) hypothesized that the heat conduction of

diamonds synthesized on the basis of the isotope ^{13}C (and containing 0.1 percent ^{12}C) should be just as high because the energy characteristics of phonon processes differ by a factor of $(^{12}\text{C}/^{13}\text{C})^{1/2}$ for diamonds synthesized on the basis of the isotopes ^{12}C and ^{13}C . Ositinskaya et al. further state that in view of the fact that the difference between the masses of ^{13}C and ^{14}N is smaller than that between the isotopes ^{12}C and ^{14}N , diamonds synthesized on the basis of ^{13}C should have a higher heat conduction than diamonds synthesized on the basis of ^{12}C . The analysis presented by Anthony et al. confirms that the observed effect of an increase in heat conduction in diamonds based on ^{12}C cannot be explained within the framework of classical thought regarding the effect of isotopes on thermal resistances, which considers isotopes to be an irregularity in crystalline structure resulting in an increase in phonon scattering. Estimates indicate that for a diamond based on ^{12}C , an isotope effect of the said type will not exceed 4 percent at a temperature of about 300 K. The described effect of an increase in heat conduction can therefore not be linked to elimination of crystalline lattice irregularity, and consequently, an increase in thermal conductivity in diamonds based on ^{13}C is not to be expected. Ositinskaya et al. have also failed to substantiate the possibility of an increase in the thermal conductivity of diamonds based on ^{13}C because of the proximity of the mass numbers of the isotopes ^{14}N and ^{13}C . In view of these and other facts, an increase in the thermal conductivity of diamonds is possible only in cases where a heavier isotope is replaced with a lighter one. If this effect is confirmed by repeated experiments, an explanation for it must be sought in an increase in the elastic properties of single diamond crystals thanks to an increase in interatomic bonds as a result of substitution of a heavier isotope by a lighter one. References 3: 1 Russian, 2 Western.

METALS

Ultrapurification of Substances by Membrane Gas Separation Method

947D0039A Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 3, May-Jun 1994
pp 7-20

[Article by V.M. Vorotynsev, P.N. Drozdov, High Purity Substance Chemistry Institute at Russia's Academy of Sciences, Nizhniy Novgorod; UDC 66.071.6+54.058]

[FBIS Abstract] Membrane gas diffusion separation—a new rapidly developing and promising chemical engineering trend which is inexpensive and can be implemented at room temperature—is discussed, and its applications for high purity gas production are considered. Ultrapurification of nuclear power plant exhaust gases by this method in order to scrub radioactive krypton and xenon and remove freon impurities from carbon tetrafluoride is examined, and a series of ultrapurification processes utilizing gas separation membranes is addressed. A large number of foreign and domestic sources are reviewed. New inorganic membranes with ultramicroscopic pores currently under development are examined, and the selectivity and permeability of various pyrolytic carbon membranes are summarized. The dependence of the separation efficiency on the impurity concentration, the dependence of the separation factor on the product extraction fraction and partial pressure ratio, and the dependence of the separation ability of a membrane cascade on the ratio of product flows through the membrane are plotted. The factors affecting separation by porous and nonporous polymer membranes are studied. An analysis shows that a continuous membrane column cascade is promising for ultrapurification of gases, and it is noted that the outlook for further advances in membrane purification methods depends primarily on the development and testing of new types of membranes with higher selectivity and permeability. Figures 6; tables 2; references 106: 48 Russian, 58 Western.

Simulation of Gas Ultrapurification in Membrane Element

947D0039B Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 3, May-June 1994
pp 38-44

[Article by Yu.P. Kirillov, V.N. Skryagin, Yu.I. Yengulatov, Scientific Research Institute of Applied Mathematics and Cybernetics at the Nizhniy Novgorod State University; UDC 66.063]

[FBIS Abstract] Expanding uses of membrane elements in scrubbing of gases, enrichment of mixtures, and recovery of pure gases, both individually and as building blocks of cascades, are discussed and it is noted that the greatest separation efficiency is obtained in membranes

with an unequal permeability to components in a counterflow. Yet the inadequacy of existing nonsymmetric flow models for analyzing gas separation in membrane cell cascades prompted a study of the effect of the gas flow ratio and impurity concentration at the cell inlet as well as other variables on the limit of individual membrane cell separation capability in the case of a plane-parallel membrane cell. A peak separation ability is attained when near-perfect displacement is achieved. For simplicity's sake, a binary gas with a low impurity concentration in a unidimensional process is considered assuming that the mixture concentration and flow rates are uniform across the cross section. The material balance equations and boundary conditions are derived. The dependence of the separative factor on the take-off fraction, pressure ratio, input flows, and input concentrations is plotted. The study shows that application of an additional impurity-free flow to the low-pressure end inlet raises the limit of separation ability while an increase in the impurity concentration at the low-pressure end inlet decreases it noticeably. This is typical of the principal characteristics of ultrapurification of gases in a membrane element. Figures 5; references 8.

Investigation of Air Filtering Efficiency of Fiber and Membrane Filters Within 0.003-0.5 μm Particle Size Range

947D0039C Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 3, May-Jun 1994
pp 45-53

[Article by V.A. Krylov, O.P. Lazukina, N.A. Gracheva, V.M. Vorotynsev, P.N. Drozdov, High Purity Substance Chemistry Institute at Russia's Academy of Sciences, Nizhniy Novgorod; UDC 541.182]

[FBIS Abstract] The stringent requirements imposed on the concentration of suspended particles which often call for follow-up filtering directly at the production line inlet and the lack of data on the breakthrough coefficients of smaller particles present in purified gases as well as the need to take into account filter contamination prompted an investigation into the efficiency of fiber and membrane air filters within a 0.003-0.5 μm particle size range and a study of their contaminating action. To this end, such domestic and foreign filters and polymer membranes as AFA, SM-13400 Sartorius, MFF, MFFK, MIFIL, SM-11807 Sartorius, FGLP-04700 Millipore, and high-purity silicon dioxide filters were examined using a diffusion aerosol spectrometer within a 0.003-0.2 μm range and a PK GTA-0.3-002 aerosol particle counter within a 0.3-1 μm range whereby the breakthrough coefficient was calculated as the ratio of the numerical concentration of a given particle fraction in the air downstream from the filter to the initial concentration. Breakthrough curves of various types of filters and the spectrum of intrinsic particles generated by the membrane filters themselves are plotted. A comparison demonstrates that at comparable filtration rates, fiber filters have a noticeably higher efficiency, have a lower

filtering loss, and release virtually no particles into the filtered medium. These filters' likely breakdown in corrosive media is the only constraint on their use. The need to take the membrane filters' contaminating effect into account is noted. Figures 4; tables 5; references 30: 18 Russian, 12 Western.

Rare Earth Metal Refining by Vapor Phase Crystallization

947D0039D Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 3, May-June 1994 pp 57-65

[Article by O.D. Chistyakov, G.S. Burkhanov, N.B. Kolchugina, N.N. Panov, Metallurgy Institute imeni A.Ya. Baykov at Russia's Academy of Sciences, Moscow; UDC 669.85:015.4]

[FBIS Abstract] Rising demand for especially pure rare earth metals due to their unique properties and expanding applications in science and engineering prompted continuing research into production of high-purity rare earth metals and single crystals by vacuum refining whereby metal is vaporized at elevated temperatures with subsequent vapor phase crystallization and condensation on a cooled surface or a surface with a temperature gradient. This process is characterized in that the impurities are separated from the metal both at the evaporation stage and during condensation according to the partial vapor pressures (or activities) of the base metal and impurities. The example of Sc, Pr, and Y is used to demonstrate the possibility of their refining by vapor phase crystallization. The impurity concentration and distribution in the metal after refining is summarized, and the Sc and Pr distillation curves and the dependence of Al concentration in Pr-Al alloys as a function of Pr concentration are plotted. The findings are compared to the analytical results obtained by Martin's and Richter's formulae. The comparison makes it possible to assess the efficiency of removing various impurities, draw the conclusion about the optimum process conditions, and select condensate batches with admixture-specific purity. Figures 3; tables 6; references 8: 6 Russian, 2 Western.

Production of High-Purity Rare and Rare Earth Metals and Some of Their Properties

947D0039E Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 3, May-Jun 1994 pp 66-75

[Article by V.F. Zelenskiy, G.F. Tikhinskiy, V.M. Azhazha, Kharkov Engineering Physics Institute at the Ukrainian Academy of Sciences; UDC 669.292.293.296]

[FBIS Abstract] Efforts in the field of production and study of pure and extra pure metals which began at the Kharkov Engineering Physics Institute in 1948 at the urging of I.V. Kurchatov are reviewed, and it is noted

that extra pure metals are especially valuable for understanding the effect of intrinsic, impurity, and other defects on the structure-sensitive properties of metals. The findings of such studies are summarized, and attention is focused on distillation, zone melting, electric field transport, and a combination of zone melting with electric field transport. The impurity distribution in yttrium along the distillation column length, the interstitial impurity concentration in refined yttrium as a function of gas pressure, and variations in the residual resistance of single crystals of various orientations along and across the samples are plotted. Data on the new phenomena and properties discovered in the study of the physical properties of highly pure metals produced by high vacuum methods, e.g., magnetic breakdown, magnetoresistance fluctuations, giant thermoelectromotive force oscillations, and Nernst thermoelectromotive force oscillations, are presented. Figures 7; tables 5; references 10: 9 Russian, 1 Western.

Effect of Vacuum Conditions on Refining of Active Refractory Metals

947D0040A Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 3, May-Jun 1994 pp 76-83

[Article by V.M. Azhazha, P.M. Vyugov, S.D. Lavrenko, Kharkov Engineering Physics Institute at the Ukrainian Academy of Sciences; UDC 669:292.293.296]

[FBIS Abstract] The urgency of removing such interstitial impurities as carbon, nitrogen, oxygen, and hydrogen while refining refractory metals and growing single crystals and the difference in the metal interaction with nitrogen and hydrogen, depending on the metal group, prompted a study of the effect of the residual gas pressure and other vacuum conditions on the degree of refractory metal purification during heating and melting in a vacuum. The behavior of the residual gas spectra during heating, melting, and Nb ingot deposition, the dependence of the melting chamber pressure on the length of metal exposure to the molten state, the behavior of partial pressures during the metal exposure to the heated state, the behavior of the partial pressure of the component with a nucleon number 28 at the annealing chamber center at various sample temperatures, and the oxygen distribution in the Zr sample length with and without absorption are plotted. A comparative analysis shows that a change in the vacuum conditions during the refining of active refractory metals by electron beam (ELP) and zone melting and electro-transport significantly affects the outcome. The better the vacuum conditions, the higher the purification degree. Figures 7; tables 5; references 13.

Electrolytic Refining of Platinum and its Alloys in Molten Salts

947D0040B Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 3, May-Jun 1994 pp 84-89

[Article by N.A. Saltykova, V.Ye. Baraboshkin, High-Temperature Electrochemistry Institute at the Urals

Department of Russia's Academy of Sciences and Yekaterinburg Nonferrous Metal Processing Plant; UDC 135.3:546.92:621.357.7]

[FBIS Abstract] The unique physical and chemical properties of platinum and Pt-group metals, e.g., their high corrosion resistance in various media, high temperature and vitrification resistance, and exceptional catalytic ability, and the considerable scarcity and cost of these metals increase the urgency of improving scrap reprocessing and refining. The experience in electrolytic deposition and dissolution of platinum metals in molten chlorides and the new commercial methods of producing iridium crucibles by electroforming and electrolytic refining of Pt-group metals from molten salts developed on this basis by the Yekaterinburg Nonferrous Metal Processing Plant are outlined. In particular, the outcome of studies of Pt and Pt-Rh, Pt-Ir, Pt-Ru, and Pt-Pd alloy scrap refining in order to remove nonprecious metals and nonmetallic compounds is described. Known commercial iridium electrolytic refining methods serve as the basis, and process stability is ensured by maintaining a constant inert gas medium. To this end, a closed-cycle electrolytic process is used in an atmosphere without traces of moisture or oxygen-containing argon compounds with the help of a bulk anode made from refined metal. A triple eutectic salt is used as the solvent-salt. The electrolytic alloy cathode residue composition as a function of the quantity of electricity transmitted is plotted. Spectral analysis of cathode residues shows that all nonprecious metal impurities are refined off in one refining process, while these metals' concentration does not exceed $10^{-3}\%$ by mass. The cathode current efficiency during the refining of Pt and its alloys depends on the dendrite residue collapsibility and reaches 90-100%. Following induction (and in some cases vacuum) melting, the refined metal can be used directly for making products; the refined metal has elevated physical and mechanical properties, such as higher ductility, improved drawing ability, etc. Figures 3; tables 1; references 9: 8 Russian, 1 Western.

New Ultrasonic Nondestructive Method of Testing Metal and Alloy Purity and Stressed State

947D0040C Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 3, May-Jun 1994 pp 100-103

[Article by O.I. Zaporozhets, L.V. Tikhonov, Institute of Physics of Metals at the Ukrainian Academy of Sciences, Kiev; UDC 620.168.4.179.16+539.319:620.179.16]

[FBIS Abstract] The unique response and sensitivity of ultrasonic anomalies of phase transitions in crystals to impurities, structural variations, and even slight external factors despite considerable differences in the elastic wave propagation mechanisms prompted the development and implementation of a new nondestructive method of testing metals and alloys with abnormal elastic properties (AUS) on the basis of available ultrasonic equipment. This method makes it possible to

determine the degree of purity of metals and alloys with abnormal elastic properties, monitor the physical and chemical nonuniformities with known abnormal elastic properties in products, monitor the stressed state of materials with abnormal elastic properties, and record the behavior of the above characteristics during machining and heat treatment. The findings obtained by using the ultrasonic method to identify pure chromium inclusions in chromium alloys, determine the substitutional impurity concentration behavior in the Cr-V-Ta-La low alloy after annealing, and study the spatial distribution of residual macrostresses in chromium following thermal cycling (TTsO) are discussed. The temperature dependence of the ultrasound velocity variation and attenuation in the alloy and the dependence of the macrostress behavior along the X-axis in the chromium sample are plotted. The study demonstrates the potential of using nondestructive ultrasonic testing methods for monitoring impurities and macrostresses in materials with abnormal elastic properties. Given an ultrasonic anomaly temperature measurement accuracy of 1°, the method's sensitivity to V or Ta impurities is close to $10^{-2}\%$ (atomic) while its sensitivity to macrostresses in metals is close to 50 MPa. The higher the anomaly temperature measurement accuracy, the higher the resolution. Furthermore, in contrast to integral physical methods, e.g., resistivity, the ultrasonic method makes it possible to study the spatial distribution of the monitored properties. Figures 3; references 12: 10 Russian, 2 Western.

Investigation of Impurity Composition of Certain Refractory Metal Compounds by Instrumental Neutron Activation Analysis

947D0040D Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 3, May-Jun 1994 pp 104-108

[Article by L.K. Kaganov, D.T. Dzhumakulov, N.M. Mukhamedshina, Nuclear Physics Institute of the Uzbekistani Republic Academy of Science, Tashkent; UDC 543:53]

[FBIS Abstract] The outlook for using high-purity refractory metal compounds in microelectronics for developing thin film LSI and VLSI chips and the need for highly sensitive analytical monitoring methods capable of identifying reliably a large number of impurities, particularly the instrumental neutron activation method, prompted an investigation of the impurity composition of MoSi₂, WSi₂, TiB₂, NbB₂, TiC, and NbC. In-pile neutrons with various energy spectra are used to develop the instrumental methods and a Ge(Li) detector with a 2.5 keV resolution and a programmable multichannel analyzer are used to record the radionuclide spectra. The dependence of the neutron self-shielding factor on the TiB₂ sample disc thickness and the TiB₂ spectrum are plotted. The impurity identification procedures are verified using the "added vs. found" method while the error is calculated by the standard deviation of five parallel

measurements with a confidence level of 0.95. The use of in-pile neutrons made it possible to identify up to 25 impurities in the above compounds with a detection threshold of 10^{-4} - $10^{-8}\%$ and a relative standard deviation of 0.07-0.15. Figures 2; tables 2; references 5: 4 Russian, 1 Western.

Effect of EMAL-2 Mass Spectrometer Adjustment on Accuracy and Reproducibility of Analytical Results

947D0040E Moscow VYSOKOCHISTYYE VESHCHESTVA in Russian No 3, May-Jun 1994 pp 121-128

[Article by V.I. Belousov, I.D. Kovalev, A.M. Potapov, S.V. Chernyakov, High Purity Substance Chemistry Institute at Russia's Academy of Sciences. Nizhniy Novgorod; UDC 541.51.062]

[FBIS Abstract] The versatility, high sensitivity, and sampling sterility of the EMAL-2 laser mass spectrometer whose relative sensitivity coefficient (KOCh) cannot be reproduced in other instruments and the remaining difficulty of attaining and maintaining the instrument's analytical characteristics in order to realize its sensitivity and accuracy prompted an overview of the operating experience of EMAL-2 mass spectrometers in the Scientific Research Institute of Materials Science and High Purity Substance Chemistry Institute at Russia's Academy of Sciences which led to the development of a new method making it possible to improve the reproducibility and accuracy of analysis. The proposed procedure differs significantly from the manufacturing plant's suggested technique and entails a full scope of preparatory steps as well as certain partial adjustment stages required in the course of operation. The adjustment procedure's final step is an analysis of a standard sample with certified impurities. The discrimination phenomena at all stages of ion beam shaping and transmission, including the effect of the dissipated magnetic field, are considered. Figures 8; tables 1; references 5.

Photoconductivity of $MnIn_2S_4$ Single Crystals

947K0110A St. Petersburg FIZIKA I TEKHNIKA
POLUPROVODNIKOV in Russian No 5, May 1994
(manuscript received 9 Apr 93; signed to press
24 Nov 93) pp 752-755

[Article by N. N. Niftiyev, A. G. Rustamov, O. B. Tagiyev, Azerbaijan Tusi State Pedagogical Institute, Baku, Azerbaijan]

[FBIS Abstract] The spectral distribution and temperature extinguishing of photoconductivity are studied in $MnIn_2S_4$ single crystals, as well as the lux-ampere characteristics at various temperatures and light intensities. The spectral distribution of photocurrent in $MnIn_2S_4$ single crystals covers the 369-900 nm range and consists of three individual bands. The features of each band are described. The temperature dependence of photocurrent at various illuminations is shown in the region of intrinsic absorption. Beginning at 80 K photocurrent increases with temperature to 145 K, after which it decreases and photoconductivity is extinguished. The energy position (0.66 +/- 0.02 eV) and concentration of recombination centers are determined. Figures 3; references 12: 8 Russian, 4 Western.

Electron Spectrum of 2-D and 3-D Quantum Wells Based on Narrow Gap Semiconductors

947K0110B St. Petersburg FIZIKA I TEKHNIKA
POLUPROVODNIKOV in Russian No 5, May 1994
(manuscript received 8 Jul 93; signed to press
24 Nov 93) pp 767-771

[Article by B. G. Idlis, M. Sh. Ustanov; Lebedev Physics Institute, Russian Academy of Sciences, Moscow]

[FBIS Abstract] The example of two-dimensional and three-dimensional quantum wells formed by narrow-gap semiconductors with mutually inverted zones is used to study boundary states spectra. There is a critical radius value at which all levels within the gap are forced into a continuous spectrum and there are no localized states. For finite radii of a spherical well the spectrum of states localized to the boundary consists of a series of discrete levels distinguished by total angular momentum values. Figures 2; references 6: 5 Russian, 1 Western.

Static Characteristics of a Pseudomorphic Selectively-Doped Field Transistor

947K0110C St. Petersburg FIZIKA I TEKHNIKA
POLUPROVODNIKOV in Russian No 5, May 1994
(manuscript received 23 Mar 93; signed to press
7 Dec 93) pp 790-795

[Article by A. S. Ignatyev, V. E. Kaminskiy, V. B. Kopylov, G. Z. Nemtsev, Institute of Radio Engineering and Electronics, Russian Academy of Sciences, Moscow]

[FBIS Abstract] Pseudomorphic selectively-doped transistors based on AlGaAs/InGaAs/GaAs systems are created and their static characteristics studied.

$Al_{0.27}Ga_{0.73}As/In_{0.13}Ga_{0.87}As/GaAs$ selectively-doped field transistors are compared with $Al_{0.23}Ga_{0.77}As/GaAs$ field transistors. Pseudomorphic transistors, even those with a small indium mole fraction, have significant advantages over typical isomorphic devices based on AlGaAs/GaAs when they are used for microwave applications. This is due to the higher saturation currents and greater curvature of the volt-ampere characteristic, which are achieved due to the electrophysical parameters of $In_yGa_{1-y}As$. This article presents a quantitative analysis of the volt-ampere characteristics. The threshold voltage for a pseudomorphic transistor is -0.41 V. Figures 4; references 16: 5 Russian, 11 Western.

Relaxation of Transverse Acousto-Electric Voltage in Epitaxial GaAs Structures

947K0110D St. Petersburg FIZIKA I TEKHNIKA
POLUPROVODNIKOV in Russian No 5, May 1994
(manuscript received 3 Aug 93; signed to press
7 Dec 93) pp 796-801

[Article by I. V. Ostrovskiy, S. V. Sayko, R. K. Savkina, Kiev University, Kiev, Ukraine]

[FBIS Abstract] This paper studies the relaxation part of the transverse acousto-electric voltage at different amplitudes of surface acoustic waves in epitaxial semiconductor GaAs structures. The falling part of the acousto-EMF signal is interpolated by the sum of three exponents which correspond to different types of traps at the interface of the epitaxial layer and the substrate. As the strength of the generating radio frequency pulse increases, the contribution of the deep capture centers to the transverse acousto-electric voltage increases sharply. This leads to an increase in the relaxation time of the acousto-EMF signal. Analysis of the relaxation transverse acousto-electric voltage can be used to determine the relaxation time and number of basic types of defects on the interface surface of structures with epitaxial layers. Combining these measurements with others one can estimate the concentration of these types of defects. Figures 4; references 13: 4 Russian, 9 Western.

Features of Photoconductivity and the Photomagnetic Effect in $Mn_xHg_{1-x}Te$ Epitaxial Layers at Low Temperatures

947K0110E St. Petersburg FIZIKA I TEKHNIKA P
OLUPROVODNIKOV in Russian No 5, May 1994
(manuscript received 18 Oct 93; signed to press
7 Dec 1993) pp 802-807

[Article by S. G. Gasan-zade, I. P. Zhadko, E. A. Zinchenko, N. V. Sochinskiy, G. A. Shepelskiy, Institute of Semiconductors, Ukrainian Academy of Sciences, Kiev, Ukraine]

[FBIS Abstract] Spectral, temperature, and field dependences of the photomagnetic effect and photoconductivity are measured, as well as the Hall coefficient (R_H) in epitaxial layers of $Mn_xHg_{1-x}Te/CdTe$ ($x = 0.09-0.012$)

grown using liquid-phase epitaxy. In most samples, the Hall coefficient was virtually independent of temperature to 4.2 K. In some samples, R_H increased as temperature decreased. This is explained with a two-layer model (n-layer and p-layer). The article bases its conclusions on samples of the first type, with one-layer structures. An anomalous photomagnetic effect is detected which is associated with the presence of variable zones in epitaxial layers near the heteroboundary. At the temperature of liquid helium, 4.2 K, the heated component dominates in the photomagnetic effect. The component oscillates in the magnetic field. The photoconductivity data are used to determine the dependence of the lifetime of current carriers in epitaxial layers on temperature at 4.2-290 K. In the region of intrinsic conductivity, interzone Auger-recombination dominates in recombination. In the region of dopant conductivity (below 140 K) transitions through the dopant level (the Shockley-Reed mechanism) dominate. Figures 4; references 7: 5 Russian, 2 Western.

Study of InP/InGaAs Hetero Structures With the Photo-EMF Method and Using an Organic Liquid

947K0110F St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 5, May 1994 (manuscript received 24 Nov 1993; signed to press 7 Dec 1993) pp 826-829

[Article by A. V. Pashuk, T. A. Fursenko, "Elektron" Scientific Research Institute, St. Petersburg]

[FBIS Abstract] InP/InGaAs heterostructures with different thicknesses of the surface epitaxial InP layer are studied spectrally (nondestructively) using the photo-EMF method with organic liquids. An experimental formula is obtained for the dependence of the thickness on the ratio of photo-EMF values in different parts of the spectrum. Physical mechanisms of the processes are examined and the possibility of using the method to determine the thickness of a surface epitaxial layer in other heterostructures is examined. A qualitative explanation of the results is given. Figures 2; references 7: 5 Russian, 2 Western.

New Metastable Center in Irradiated GaAs

947K0110G St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 5, May 1994 (manuscript received 13 Sep 93; signed to press 9 Dec 93) pp 857-860

[Article by T. I. Kolchenko, V. M. Lomako, Sevchenko Scientific Research Institute of Applied Physics Problems at Belarus State University, Minsk, Belarus]

[FBIS Abstract] Spectroscopy of deep levels of n-GaAs samples irradiated with electrons ($E = 3.5$ MeV) yielded observations of a previously unknown center exhibiting complex metastable behavior (C-center). The C-center is at 150 K in the spectrum. Electron capture at this center is complex, and the center amplitude increases with

pulse length. The emission activation energy of the center is on the order of 0.3 eV. The effectiveness of introduction depends substantially on the energy of the bombarding electrons and the technology of growing the material. This distinguishes this defect from known defects E1-E5. Taken together, all the experimental results indicate that the C-center is a complex which includes an atom of dopant or residue. The metastable nature of the center may be due to internal restructuring controlled by the charge state. Figures 2; references 7: 2 Russian, 5 Western.

Autosolitons in a Ge Plasma of Inhomogeneous Temperature

947K0110H St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 5, May 1994 (manuscript received 30 May 91; signed to press 16 Oct 1993) pp 900-903

[Article by K. M. Aliyev, R. I. Bashirov, M. M. Gadzhialiye, Amirkhanov Institute of Physics, Russian Academy of Sciences, Makhachkala]

[FBIS Abstract] This paper presents results of experiments which show that in the process of b-drift (thermal drift) autosolitons spontaneously arise at high levels of plasma pumping due to instability of its quasi-homogeneous state. Thermal drift leads to current instability in semiconductors affecting the mobility of electrons and holes. In the samples used in the experiment, b-drift led to a rectified current. Changes in current and voltage over time for a back bias voltage are shown in figures. When the back bias voltage is increased, a thermal gradient drift domain appears, that is, an area of increased resistance depleted of charge carriers due to a nonuniform temperature gradient in the sample. After breakdown of the domain, the resistance decreases and after a period of time (the time of formation of an autosoliton in the sample) a pulsing autosoliton spontaneously arises in the sample. The amplitude of the autosoliton changes complexly with a change in voltage. Figures 2; references 10 (Russian).

Effect of Annealing Conditions on the Surface Morphology of GaAs Grown on GaAs(100) Vicinal Substrates With Molecular Beam Epitaxy

947K0110I St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 5, May 1994 (manuscript received 6 Dec 1993; signed to press 15 Dec 1993) pp 904-907

[Article by N. N. Ledentsov, G. M. Guryanov, G. E. Tsyrin, V. N. Petrov, Yu. B. Samsonenko, A. O. Golubok, S. Ya. Tipisev, Ioffe Physicotechnical Institute [Ledentsov], Institute of Analytical Instrument Building, Russian Academy of Sciences, St. Petersburg]

[FBIS Abstract] The effect of spontaneous formation of ordered masses of microfacets on GaAs surfaces is of interest for the formation of quantum wire and quantum

point heterostructures, as well as for understanding fundamental properties of surfaces. This paper presents some results on the effect of the duration and temperature of annealing on GaAs surface structure. No previous research has been done on the effect of post-growth annealing on surface properties. The structure was grown with molecular beam epitaxy on vicinal GaAs(100) surfaces. Annealing surface morphology was studied *in situ* with a scanning tunneling electron microscope. Annealing was performed at 670°C for 40 and 80 minutes. A mosaic structure in the form of points was

formed. The period of faceting can be controlled by varying annealing conditions. As annealing temperature decreases, effects which cause the segregation of gallium on the surface are suppressed. It is found that the structure of facets on a vicinal GaAs(100) surface is substantially affected by the temperature and duration of annealing in molecular beam epitaxy. This indicates that there is less free energy in the vicinal GaAs(100) surface in molecular beam epitaxy than in gas phase epitaxy with metal-organic compounds. Figures 2; references 7: 2 Russian, 5 Western.

OPTICS AND HIGH-ENERGY TECHNOLOGY

CW Supersonic First Overtone Chemical HF Laser

947F0192A Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 21 No 5, May 1994 (manuscript received 1 Oct 1993) pp 409-413

[Article by B. P. Aleksandrov, N. Ye. Vtorova, L. D. Isayeva, V. A. Shcheglov, Lebedev Physics Institute, Russian Academy of Sciences, Moscow]

[FBIS Abstract] The feasibility of highly efficient laser using overtone vibrations in a supersonic continuous wave HF laser with a slot nozzle array is analyzed theoretically. The study was based on simultaneous solution of the laser kinetics equations and Navier-Stokes equations. The latter were examined in the framework of a "narrow channel" model for single nozzles and in the mixing (lasing) zone. The energy parameters of overtone lasers are calculated (transitions 2-0, 3-1), that is, the specific energy output, the reduced power, and the distribution of radiative loads along the flow. The efficiency of conversion using overtone s exceeds 30% of the efficiency of conversion using the fundamental tone. Comparative analysis of the lasing characteristics of fundamental tone and overtone lasers revealed that the maximum power and maximum output obtained under virtually identical conditions were the same for both. Overtone amplification was almost two orders of magnitude lower, on the order of 10^{-3} cm^{-1} (maximum). Figures 5; references 12: 6 Russian, 4 Western.

Evaluation of Aging and Irradiation Degradation Resistance of cw InGaAsP and GaAlAs Heterolasers

947F0192B Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 21 No 5, May 1994 (manuscript received 10 Aug 1993) p 422

[Article by A. A. Kochetkov]

[FBIS Abstract] This paper studies the degradation of GaAlAs and InGaAsP injection heterolasers in aging and irradiation by a stream of fast particles. The distribution of main parameters (x) corresponds to a normal law, and the distribution of failures due to aging and irradiation corresponds to a logarithmically normal law. The average threshold current prior to the onset of degradation, when considered with two coefficients which remain constant when the dispersion of the distribution of parameter x remains constant during aging and irradiation degradation, is an informative indicator of the kinetics of these processes. Degradation kinetics are found to be equivalent in heterolasers in aging and irradiation. The statistical approach may be used to analyze heterolaser degradation caused by other factors. Table 1; references 4: 3 Russian, 1 Western.

Radiation Properties of a Chemical O-I Laser with an Unstable Telescopic Resonator and Exit Mirror with a Gaussian Reflection Profile

947F0192C Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 21 No 5, May 1994 (manuscript received 19 Oct 1993) pp 443-445

[Article by A. P. Zaikin, Samara branch, Lebedev Physics Institute]

[FBIS Abstract] This paper presents a numerical study of the spatial distribution of radiation in an oxygen-iodine laser with an unstable telescopic resonator and an exit mirror with a Gaussian reflection profile. For practically interesting parameters of this resonator, a smooth field is generated which fills the aperture of the resonator homogeneously. The field phase has a large (on the order of 10 rad) linear component. The field in the far zone is concentrated in one peak, and its width is close to the diffraction limit. The results indicate that this resonator will have a positive effect on the quality of radiation of other gas-flow lasers with preset population inversion. Figures 3; references 10: 6 Russian, 4 Western.

Contactless Transmission Method To Measure Laser Radiation Energy Characteristics

947F0192D Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 21 No 5, May 1994 (manuscript received 17 Sep 1993) pp 483-485

[Article by B. N. Morozov, All-Russian Scientific Research Institute of Physicotechnical and Radiotechnical Measurement, Mendeleyevo, Moscow Oblast]

[FBIS Abstract] This paper examines a contactless method of measuring energy distribution and determining the total energy of laser beams with a large diameter propagating in air. The energy distribution is found using known methods of processing interference fringes. Compact formulas are presented for this. A schematic for a crossed Mach-Zehnder interferometer is presented. It is one of the most sensitive interferometers used for the propagation of pulsed laser radiation in air when absorption at several wavelengths is minimal. The transmission method error (25%) can be reduced with a single calorimetric calibration. The upper limit is determined by breakdown in air and self-induced transparency. The physical foundations of the method are presented as well as basic formulas for beam defocusing in air. One can measure the beam energy distribution and the total energy of the beam with this method. Figure 1; references 7 (Russian).

Narrowband Tunable Pulsed Dye Laser for Laser Isotope Separation

947F0192E Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 21 No 5, May 1994 (manuscript received 15 Oct 1993) pp 502-504

[Article by S. A. Kostritsa, V. A. Mishin, Institute of General Physics, Russian Academy of Sciences, Moscow]

[FBIS Abstract] A system is proposed for precision tuning of dye laser frequency with grazing incidence on a grating. The system is based on the use of a glass wedge of a specially selected angle and thickness. The wedge is placed between the grating and a non-transmitting mirror. When the wedge is rotated, the laser frequency is tuned; there is no hopping of the longitudinal resonator cavity modes. This tuning mechanism sharply reduces the requirements placed on the frequency tuning system. The dye laser system can be used in isotope separation systems using isotopically-selective photoionization of atoms. Unresolved issues are the optimal placement of the wedge axis of rotation and the requirements on the accuracy of initial wedge positioning. Figures 3; references 4 (Western).

NUCLEAR AND NON-NUCLEAR ENERGY

A Nuclear Sword Over the City

947F0154A Moscow TRUD in Russian No 1, July, 1994 p 2

[Article by A. Iushchenko, A. Petrov; UDC 621.382]

[FBIS Translated Text] PEOPLE OF SEVERODVINSK DO NOT WANT TO BE "NUCLEAR HOSTAGES" The chief of Archangelsk District Administration P. Balakshin jokes bitterly: "Where is the world longest submarine? In Russia. Its stern is located in Severodvinsk and the bow in St. Petersburg".

When an unaccounted stern of a nuclear submarine was detected in the Severodvinsk, the town was alarmed. No wonder! A nuclear reactor remains in this section of the vessel, which in addition is in an emergency condition. Initially, the North Sea Fleet Administration categorically denied that it has anything to do with this delay-action mine.

But later, the origin of the "find" was determined. The ailing boat, named "order 900", was cut in pieces. The bow was towed to Saint Petersburg. The stern with the reactor turned up in the Severodvinsk. It was planed to scuttle all this in the ocean, but a sharp turn in thinking occurred in our minds. They stopped scuttling the reactors, but still do not know where to put them.

The North Sea Fleet finally admitted being the owner of the reactor. It was cordoned, but this brought no relief to the local authorities. By this time it was determined, that after ratification of the agreement on reduction of nuclear armaments, the submarine missile carriers had been shredded: the reactors and all kind of mechanisms for firing long range missile were cut out, and the parts were carried away, so that the American satellite would be able to record this peaceful act from the sky. Generally, this is not a bad thing, but no preliminary economic planning was made. The consequences of this "disarmament race" were not envisioned. At this time the Severodvinsk has plenty of nuclear objects that no one

needs. Submarines which served their time are piled-up here. Some of them leak as old troughs. Four reactors display signs of seal failure.

However, the trouble lies not just in nuclear submarines. Two and a half thousand cubic meters of liquid radioactive waste was accumulated in the Severodvinsk at the beginning of the year. Temporary nuclear grave-yards with solid waste are located in the vicinity. It would be proper to call them permanent, because the years pass, but the stock is not reduced. In all, there are about 30 potentially dangerous nuclear objects, so called "active zones", located on land and sea.

According to the Head of the District Administration Ye. Komarov, today, only Murmansk can compete with the Severodvinsk. 300 nuclear reactors are accumulated there, while 40 of them are virtually within the city center. The nuclear icebreaker fleet is based here along with the temporary storage facilities.

Until recent times, the deep Barents and Karsk seas were holding out a helping hand. As recorded by observant Norwegians, more than 11 thousand containers with radioactive waste, 13 damaged reactors from submarines and three from the ice-breaker "Lenin" were dumped there from 1961 to 1990.

In the past the spent nuclear fuel was shipped to Chelyabinsk district in special containers which did not satisfy the IAEA (International Atomic Energy Agency) standards. Nobody was worried until the country agreed to adhere to the norms accepted by the international community. A new type of containers was under development. They required a new type of carriers. The railroad in the vicinity of Gremikha town (Murmansk district), which was used for transporting the nuclear waste, turned out to be unsuited for the new carriers. Severodvinsk was selected as a temporary transfer point of the dangerous cargo.

The Manager of the Nuclear Ship Building Center D. Pashayev says that at this rate of solving the transportation and utilization problem, we will need 10 years to remove all that is accumulated in the Severodvinsk. The leaking ships, which are now adapted for storing the dangerous cargo, can not wait that long. The same holds for the temporary grave-tombs on shore. The Severodvinsk residents do not wish to be "nuclear hostages". The town authorities issued a warning: if removal of the nuclear fuel waste will not be carried out in full volume, adhering to all safety measures, the plants will stop working.

At this point the North Fleet and the establishments of the Military-Industrial Complex have exhausted their resources for storing the nuclear fuel waste. But it must go somewhere. To put it mildly, dumping liquid radioactive waste from aboard a ship into the depth of the sea is not good practice. According to specialists, in the West it is poured through special tubes after a preliminary filtering. We have neither terminals, nor tubes, nor a

developed technology for quality purification. However, the pertinent documents are being signed, obligations are assumed, without making economic studies, without analyzing possible consequences. Of course, it is a bad practice to dump waste in a far sea. But it is much worse to do it near the shore after interior filtering.

It appears, that keeping a political image is more important for us than the health of our nation, says the Chairman of the Archangelsk Regional Committee on Environmental Protection A. Minyaev.

- At the present time the radiation situation in Severodvinsk and Archangelsk is quiet - claims the Nuclear Control Inspector M. Manuilov. The other specialists as well are calming the people by saying that if the established regulations are followed, the "active zones" present no danger. However, none of the specialists would bet their heads that the regulations will be adhered everywhere. And if they are violated, what then? The consequences may be disastrous. The Severodvinsk will be hit totally, Archangelsk and other populated places will also suffer. Under emergency conditions the situation will not be better in Murmansk. If this should happen, the required money will be found and works will be conducted a full rate. But the people of the North, who live here would have to pay a dear price in the Chernobyl way for the present day complacency. God save us from this.

MECHANICS OF GASES, LIQUIDS, AND SOLIDS

Action of Square Pulse of Neodymium Laser on Porous Metal Targets

947F0188A Minsk INZHENERNO-FIZICHESKIY ZHURNAL in Russian Vol 66 № 2, Feb 1994 (manuscript received 18 Jul 1992) pp 179-183

Article by V.K. Goncharov, V.L. Kontsevoy, M.V. Puzyrev, and A.S. Smetannikov, Scientific Research Institute of Physics Application Problems imeni A.N. Sevchenko, Minsk; UDC 535:533.9]

[FBIS Abstract] Action of a pulsed neodymium laser on porous metal targets was studied in an experiment with compacts of aluminum powder (0-0.1 μm grain size), tungsten powder (0-0.30 μm grain size), and 70 % Al + 30 % W powder. Such pellets were treated with nearly square pulses of up to 400 J radiation energy and 400-500 μs duration. The gas in the pores in such pellets heats up and expands fast, the pellets being broken unlike monolithic metal targets. The fragments were examined by transverse probing of the erosion jet with a ruby laser emitting radiation pulses of 1 μs duration in 2.5 ms long trains, with a power not exceeding 10 kW/cm² so as not to perturb the medium. A pellet was placed inside an integrating hollow spherical, making it possible to monitor the absorption coefficients as well as both transmission and reflection coefficients. The results

indicate a selective vaporization of aluminum and tungsten particles in their mixture when the power density of incident radiation has reached a certain level, aluminum particles continuing to evaporate while tungsten particles still remain intact. For a theoretical interpretation of the results, the cross-sections for scattering and absorption of incident probing electromagnetic waves by particles are calculated in accordance with Mie's theory (infinite series of complex coefficients in terms of Riccati-Bessel functions and their derivatives), assuming the particles to be homogeneous and spherical. These calculations facilitate a quantitative analysis of the erosion jet for the size distribution of tungsten particles and the diminution of aluminum particles as a function of treatment time.

Change in Structural State of Titanium during Electrothermal Treatment in Liquid Nitrogen

947F0188B Minsk INZHENERNO-FIZICHESKIY ZHURNAL in Russian Vol 66 № 2, Feb 1994 (manuscript received 5 Oct 1992) pp 245-248

[Article by V.N. Nikiforenko, I.S. Braude, O.P. Salita, and V.G. Khomenko, Institute of Low Temperature Engineering Physics at Ukrainian Academy of Sciences, Kharkov; UDC 669.295:537.311.31:53.09]

[FBIS Abstract] An experimental study of grade VT1-0 commercially pure titanium was made concerning the effect of electrothermal treatment during its submergence in liquid nitrogen. Initially polycrystalline α -phase rolled titanium specimens of the 6 μm grain size fraction were placed in a nitrogen cryostat at a 77 K temperature, at which their electrical resistance was measured. Electric current pulses of 5 kA/cm² density were sent through them, each pulse followed by a pause allowing them to cool back to 77 K. Their grain size at room temperature before and after treatment in the cryostat was obtained from metallographic and x-ray data. Their phase composition was determined from debyograms. The surface of flat specimens was photographed with an x-ray camera using a CuK_α-radiation source and a Ni-filter, for measurements and analysis in a microphotometer. These revealed an enlargement of the α -phase grains up to 20 μm as a result of collective recrystallization and no formation of the β -phase, the only new phase detected being rutile TiO₂ and this indicating an active diffusion of oxygen from never perfectly pure nitrogen into titanium. The at least 1200+77 K temperature difference and the presence of grain boundaries were found to produce stresses due to anisotropy of the thermal expansion coefficient characterizing a rolled material. The electrical resistance was found to increase up to a saturation level after successive recrystallization cycles, evidently due to increasing oxidation not so much of titanium as of its ferromagnetic and paramagnetic impurities (0.3 % Fe). Neither the thermal stresses nor the martensitic transformation during rapid cooling after rapid heating were found to influence the dependence of the electrical resistance

increment on the number of recrystallization cycles, that transformation being evidently attended by a contraction without change of orientational and dimensional correspondence. Considering the importance of

oxygen, its diffusion coefficient is calculated using the dependence of vacancy relaxation time at grain boundaries on the energy of vacancy migration from grain boundaries. Figures 2; references 10.

Natural-Climatic Changes in Western Siberia to the Year 2000

947N0060 Novosibirsk GEOLOGIYA I GEOFIZIKA in Russian Vol 35 No 1, Jan 1994 (manuscript received 29 Mar 1993) pp 3-21

[Article by S. A. Arkhipov, V. S. Volkova, V. A. Bakhareva, M. R. Votakh, T. P. Levina, S. K. Krivonogov, L. A. Orlova; UDC 551.582(571. 1)]

[FBIS Abstract] A predictive scenario is presented for the landscape and climatic situation to the year 2000. This is based on the principle of paleoclimatic analogies, which establishes the correlation between concentrations of CO₂ in the atmosphere and the surface layer of ocean with global Earth temperatures. By the year 2000, the anthropogenic factor will increase CO₂ levels to values which occurred at the climatic optimum of the Holocene. Chronostratigraphic and paleobotanic studies have reconstructed the landscape-climatic situation of this optimum which occurred in Western Siberia about 5,500 years ago. Sea level variations are considered. By analogy, by the year 2000 a milder, warmer, and more humid climate than the current one is predicted. If conditions are created which are similar to the Holocene optimum, areas north of 66°N are at risk for an extreme restructuring of all natural processes due to increased precipitation and higher summer temperatures. Figures 6; table 1; references 47: 42 Russian, 5 Western.

Experimental Estimates of Stationarity of Underwater Oceanic Noise

947N0064A Moscow AKUSTICHESKIY ZHURNAL in Russian Vol 40 No 3, May-June 1994 (manuscript received 2 Nov 1993) pp 357-361

[Article by A. A. Aredov, G. M. Dronov, N. N. Okhrimenko and A. V. Frudev, Acoustics Institute imeni N. N. Andreyev, Russian Academy of Sciences; UDC 551.463.228]

[FBIS Abstract] With the passage of a squall or internal wave or during unstable, suddenly changing weather, and in the polar regions during the hummocking of ice, oceanic noise becomes essentially nonstationary, but other than for some specific regions and periods of time noise with a probability approximately 90% can be considered a quasi-stationary process for records with a duration from 10-20 s to 3-5 min. This usually ensures

adequate averaging of rapid fluctuations, including those associated with surface waves, and the influence of slow variations caused by variability of meteorological and hydrological conditions is still negligible. Proceeding on the basis of these considerations, the results of an analysis of experiments involving study of the variability and stationarity of noise fields in the ocean are discussed. Data are given on the limits of quasi-stationarity of segments of time records of such noise with different conditions for the generation and development of the noise field. The influence of a squall, gusty storm wind, large surface and internal waves on the stationarity of oceanic noise is shown in a series of figures representing the deviation of noise from a Gaussian distribution at a frequency 1 kHz using antenna arrays oriented at different angles. The time intervals of noise quasi-stationarity under stable weather conditions are determined under a variety of observation conditions. The findings presented in the study cannot be generalized and would be different for different seasons of the year and different regions of the ocean. Figures 4; references 8: 5 Russian, 3 Western.

Detection of Toxic Metals in the Environment

947N0061 Tomsk OPTIKA ATMOSFERY I OKEANA in Russian Vol 7 No 4, Apr 1994 (manuscript received 25 Apr 1991) pp 492-496

[Article by A. V. Antinov, G. V. Kashkan, Optika Design-Technological Institute, Siberian Division, Russian Academy of Sciences, Tomsk, Tomsk Polytechnical University; UDC 543. 272.7]

[FBIS Abstract] On 27 June to 7 July 1993 the concentration of a number of heavy metals (copper, titanium, lead, zinc, chromium, manganese, iron, vanadium, barium, nickel, bismuth, molybdenum, thallium, strontium, gallium, and germanium) was measured in water and air above the upper Volga. Atomic-absorption and atomic-emission measurements were taken. Measurements of the mercury concentration (using the atomic absorption method) were made using a small RGA-11 analyzer with Zeeman background correction. Much of this paper is devoted to the operation of the RGA-11. Water samples were taken at seven sites along the Volga. Concentrations of all elements were found to be below (or in a few cases near) the maximum permissible concentration. The exception was an extremely high iron reading in Kostroma. The findings are presented in tables. Figures 2; tables 2.

BIOTECHNOLOGY

Stochastic Analysis of Direct Transport of Ions Through Potassium Channels of Biological Membranes

947C0340A Minsk DOKLADY AKADEMII NAUK BELARUSI in Russian Vol 37 No 6, Nov-Dec 1993 (manuscript received 22 Nov 1992) pp 69-73

[Article by V. G. Veresov, Institute of Photobiology, Belarus Academy of Sciences; UDC 539.199:577.352.462]

[FBIS Abstract] The Brownian movement method was used to study direct transport of K^+ , Na^+ , Li^+ , Rb^+ , and Cs^+ , which is based on Langevin's stochastic equations for ions (given in source), on a model channel with entrance tubes to a tunnel-shaped segment between two wide regions and vestibules. The tunnel walls had repellent₊ walls and contained 12 pairs of Arg⁺—Glu⁻ and Arg⁻—Asp⁺ ions simulated with dipoles with poles 1 Angstrom apart. Coefficients of diffusion in solution and tunnel phase were used to calculate one-way flow in a solitary potassium channel model, mean transport time, estimated and experimental values of permeability coefficients for different ions. Illustrations 5, tables 2; references 15: 2 Russian, 13 Western.

Use of Chamber Model to Study Radionuclide Migration in Soil of Some Belarus Regions

947C0340B Minsk DOKLADY AKADEMII NAUK BELARUSI in Russian Vol 37 No 6, Nov-Dec 1993 (manuscript received 29 Jul 1992) pp 74-78

[Article by V. A. Knatko, A. G. Skomorokhov, and A. M. Kotovich, Institute of Radiobiology, Belarus Academy of Sciences; UDC 574.4.5:539.136]

[FBIS Abstract] Cesium-137 was used as a model in a study of migration of radionuclides in soil to determine accumulation in plants. The coefficients of vertical migration (CVM) are the parameters of passage through different soil layers. Soil was tested from Khoynikskiy and Volozhinsky rayons, where soil types differ from one another, and where extremely rapid migration of ^{137}Ce had been found. Soil samples 1 to 5-10 cm (deep layers) thick were taken from different depths, down to 10 cm. Formulas obtained to determine CVM are provided. Distribution of ^{137}Ce varied in soil and plants. Tables 1, illustrations 5; references 8: 4 Russian, 4 Western.

Effect of Recombinant Interleukin-1 on Generation of Active Forms of Oxygen by Human Blood Neutrophils

947C0340C Minsk DOKLADY AKADEMII NAUK BELARUSI in Russian Vol 37 No 6, Nov-Dec 1993 (manuscript received 1 Oct 1992) pp 79-81

[Article by Yu. V. Zakrevskaya, G. N. Semenkova, S. N. Cherenkevich, P. P. Murzenok, and corresponding

member V. N. Gurin, Belorussian State University, Institute of Physiology, Belarus Academy of Sciences; UDC 577.2:612.071.1]

[FBIS Abstract] A study was made of the effect of recombinant interleukin-1 β (rIL), of the Dainippon firm (Japan) on activation of oxygen by neutrophils with and without cell contact with slide surface, in order to examine molecular mechanisms of interleukin-1 effects on endocytosis and yield of lysosomal enzymes. Human plasma neutrophils were used; generation of active forms of oxygen was studied by luminol-dependent chemiluminescence techniques, and measurements taken at room temperature in Earle's medium. Superoxide dismutase, 1,4-diaza bicyclo[2.2.2]octane, and catalase were used to identify active forms of oxygen. It was found that rIL does not elicit production of active forms of oxygen in human neutrophils, but enhances activation of oxygen related to the function of the intracellular oxygen-activating system, which is apparently triggered by superoxide anion radicals formed on the cell surface. Illustrations 2; references 13: 5 Russian, 8 Western.

Formation of Collection of Clones of Rye DNA With Low Number of Sequence Replicas

947C0341A Minsk DOKLADY AKADEMII NAUK BELARUSI in Russian Vol 37 No 5, Sep-Oct 1993 (manuscript received 22 Oct 1992) pp 66-68

[Article by G. V. Bozhok, V. N. Korzun, M. I. Prosnjak, and corresponding member N. A. Kartel, Institute of Genetics and Cytology, Belarus Academy of Sciences; UDC 577.21]

[FBIS Abstract] Such a collection is desirable because of the importance of rye as a crop to Belarus and other western regions, and they can be used as genetic markers for demonstration of polymorphism of length of restriction fragments. The method used to obtain recombinant clones involved use of methylation-sensitive Pst I restriction enzyme, and DNA plasmid pBR322, with separation of restricted DNA fragments with agarose. Restricted Pst I from linear form of pUC19 plasmid served as cloning vector. Recombinant clones were screened by means of dot hybridization and electrophoresis, with λ DNA sliced with Hind III serving as a marker. Blot hybridization with recombinant clone ScB70 is described. Illustrations 2; references 13: 1 Russian, 12 Western.

Change in Level of X-Ray-Induced Chromosomal Aberrations in Mice After Administration of Thymogen and Solcoseryl

947C0341B Minsk DOKLADY AKADEMII NAUK BELARUSI in Russian Vol 37 No 5, Sep-Oct 1993 (manuscript received 12 Aug 1992) pp 77-80

[Article by G. V. Kraskovskiy, G. I. Mironova, L. V. Gorobets, and S. D. Rosetskaya, Institute of Genetics and Cytology, Belarus Academy of Sciences; UDC 616.006.02.009.097]

[FBIS Abstract] Mice in different groups received intraperitoneal injections of thymogen (assumed to be a cell mediator and previously shown to reverse radiation-induced aberrations) 30 min and 5 h after irradiation, or solcoseryl (protein-free extract of cattle blood, shown to accelerate healing of ulcers and tissue regeneration) 1 and 5 h in one group, 5 min and 5 h after total-body irradiation in another, dosage 300 R; colchicine was given to all groups 24 h after exposure. Animals were sacrificed 1.5 days after irradiation, and bone marrow was examined. Changes consisted of single fragments, paired fragments, exchanges, and the number of aberrations is tabulated according to their nature. The two cell mediators caused marked recovery from radiation-induced chromosomal structures, by enhancing repair processes. The mechanism of action may differ for the two agents used because of the differences in their biochemistry. Solcoseryl contributes building material for synthesis of nucleic acids while thymogen is a building block for synthesis of damaged enzymes involved in repair and protein synthesis. Tables 1; references 15: 14 Russian, 1 Western.

Hybrid DAS-ELISA for Potato Virus A

947C0398A Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 19 No 10, Oct 1993 (manuscript received 23 Feb 1993; in final form 20 May 1993) pp 941-949

[Article by T.N. Yerokhina, S.M. Ambrosova, Yu.A. Varitsev, Yu.S. Malofeyeva, V.P. Knyazeva and A.V. Kulyavtsev, Institute of Bioorganic Chemistry imeni M.M. Shemyakin and Yu.A. Ovchinnikov, Russian Academy of Sciences, Moscow; Potato Culture Scientific Industrial Association, Russian Agricultural Academy, Korenevo, Moscow Oblast; UDC578.85/86.083.3]

[FBIS Abstract] Hybrid DAS (double antibody sandwich)-ELISA methodology was developed for the detection of potato virus A (PVA), based on a monoclonal MA 5.3 antibody that recognized a universal PVA epitope. The most sensitive DAS-ELISA was obtained when the polystyrene planchets were sensitized with anti-PVA polyclonal antibody. Trials with purified viral preparations yielded a sensitivity on the order of 3-8 ng/ml, while detection limit with Nicotiana tabacum juice extended to a dilution of 1:1280. Figures 6; references 19: 4 Russian, 15 Western.

Generation of Monoclonal Antibodies Against Phenobarbital

947C0398B Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 19 No 10, Oct 93 (manuscript received 13 Apr 1993) pp 950-954

[Article by N.P. Danilova, A.B. Dzgoyev, N.I. Bekman and R.G. Vasilov, 'Biotehnologiya' Scientific Industrial Association, Moscow; UDC615.214:57.083.3]

[FBIS Abstract] Technical details are presented on the immunization of BALB/c mice with a keyhole limpet

hemocyanin-phenobarbital conjugate and subsequent fusion of the spleen cells with mouse myeloma P3-X63-Ag8.653 for generation of monoclonal antibodies against phenobarbital. Immunochemical studies and indirect ELISA analysis of the ascitic fluids yielded three IgG2 monoclonal antibodies. One clone evidenced a high affinity constant of $1.6 \times 10E9 M^{-1}$ and minimal cross-reactivity with phenobarbital congeners. Figures 1; tables 1; references 8: 2 Russian, 6 Western.

Solid-Phase Competitive ELISA for Determination of Cardenolides in Digitalis Lanata

947C0398C Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 19 No 10, Oct 1993 (manuscript received 26 Feb 93; in final form 09 Apr 93) pp 955-960

[Article by S.N. Yeremenko, I.Ye. Sukhov and A.I. Miroshnikov, Institute of Bioorganic Chemistry imeni M.M. Shemyakin and Yu.A. Ovchinnikov, Russian Academy of Sciences, Moscow; UDC578.85/86.083.3]

[FBIS Abstract] Description is provided of a solid-phase competitive enzyme immunoassay for cardenolides in extracts of digitalis lanata. The use of a IgG1 monoclonal antibody with an affinity constant of $5 \times 10E9 M^{-1}$ raised against digoxin yielded an assay with a sensitivity of 0.1 nmoles/ml for digoxin and closely related congeners (deslanoside C, lanatoside C). The use of the assay made possible detection of cardenolides in 100 µg of wet or 10 µg of dry D. lanata tissue and obviated the need for HPLC. The system has obvious application in screening D. lanata clones for high producers of cardenolides. Figures 2; tables 2; references 13: 3 Russian, 10 Western.

Efficient Inhibition of HIV Reproduction in Cell Culture by

5'-Fluoro-3'-Deoxythymidine-5'-Fluorophosphate
947C0398D Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 19 No 10, Oct 1993 (manuscript received 20 Mar 93; in final form 26 May 93) pp 978-980

[Article by A.A. Arzumanov, N.B. Dyatkina, M.K. Kukhanova, A.A. Krayevskiy, F.M. Semchenko, O.G. Yeremin and B.I. Martynov, Institute of Molecular Biology imeni V.A. Engelhardt, Russian Academy of Sciences; State Scientific Research Institute of Organic Chemistry and Technology, Moscow; UDC577.113.3:547.854.4'455.562.057]

[FBIS Abstract] Since addition of modified phosphate groups to nucleosides has been shown to mitigate their toxicity, a similar approach was tried with 5'-fluoro-3'-deoxythymidine (FLT)—known to inhibit HIV replication in tissue culture but found too toxic for clinical trials. Accordingly, 5'-fluoro-3'-deoxythymidine-5'fluorophosphate was synthesized using 1-(2-mesylenesulfonyl)-3-nitro-1,2,4-triazole as the condensing agent and obtained in a final yield of 312

mg (91%) as the ammonium salt. Testing on H9 and PBL cells showed essentially identical antiviral activities and toxicities for FLT and FLT-5'-fluorophosphate. However, the latter was far more resistant to degradation by human placental phosphatases. References 13: 5 Russian, 8 Western.

MEDICINE AND PUBLIC HEALTH

Consequences of Simultaneous Explosion of Special 'Zarya' and 'Plamya' Shells

947C0338B SUDEBNO-MEDITSINSKAYA EKSPERTIZA in Russian No 2, 1994 (manuscript received 7 Dec 93) pp 16-17

[Article by A. V. Putintsev and N. N. Kitayev (Moscow); UDC 340.62:623.4.024.5]

[FBIS Abstract] "Zarya" [Dawn] and "Plamya" [Flame] are two new devices used by Russian militia to stun criminals with high-power light and acoustic pulses. It is claimed that they present no hazard when used properly at a distance of at least 2 m (specifications for the shells are tabulated in article). Forensic medical experts assessed the consequences of accidental explosion [date of explosion not given] of 143 of these two types of shells, due to negligent handling by untrained personnel and improper storage in the militia offices. The blast partially destroyed the brick building housing the militia, killed 11 people and caused injuries varying in severity to 35. Autopsies revealed that injuries were those typically associated with blasts of explosives: severe third-degree burns over 70-80 percent of the body, extensive damage to viscera, dismemberment with body fragments 10-15 m apart, multiple fractures, contusions, internal hemorrhages, etc., and secondary injuries from falling bricks, other parts of the building and objects in the offices.

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PHARMACOLOGY AND PHYSIOLOGY

Novel Oligonucleotide Primers for Au-PCR Analysis of Human DNA: ALN1 and ALN5

947C0398E Moscow BIOORGANICHESKAYA KIIMIYA in Russian Vol 19 No 10, Oct 93 (manuscript received 23 Dec 1992; in final form 13 May 1993) pp 1013-1016

[Article by L.L. Vagner, D.A. Bessarab, Ye.P. Kopantsev and A.M. Borodin, Institute of Bioorganic Chemistry imeni M.M. Shemyakin and Yu.A. Ovchinnikov, Russian Academy of Sciences, Moscow; Medical School, Washington University, St. Louis, USA; UDC576.316.3]

[FBIS Abstract] Two novel Alu primers—complementary to sequences 206-228 (ALN1) and 222-242 (ALN5) of the human Alu repeat—were employed

for specific amplification of DNA of hybrid human-Chinese hamster somatic cells. ALN1 and ALN5 amplified human DNA, yielding different electrophoretic patterns. The most widely used Alu primer TC-65 did not promote significant amplification of the human DNA of the hybrid cells, further confirming the greater specificity of ALN1 and ALN5. Figures 1; references 10: 2 Russian, 8 Western. ae

A Procedure for Reversing Myelopoiesis Suppression in Burned Animals Using Autologous Plasma From Burned Animals

947C0311A Moscow PATOLOGICHESKAYA FIZIOLOGIYA I EKSPERIMENTALNAYA TERAPIYA in Russian No 1, Jan-Mar 1994 pp 16-17

[Article by G. K. Popov and M. I. Shtivelband; Department of Pathophysiology of the Chelyabin Medical Institute, Prof. G. A. Popov, Dr. of the Medical Sciences, Dept. Chair; UDC 616-001.17- 036.8-06:616.155.3-007.1-085]-092.9]

[FBIS Abstract] The effect of using autologous plasma from burned animals to reverse myelopoiesis suppression was studied. A GK-200 1000-W thermal lamp was used to induce 2nd- to 3rd-degree burning of the bare skin along the spinal cord of male Wistar rats and SVA mice (about 15% of total body surface area). Plasma extracted from these animals 24 hours after they were burned was used to treat animals with similar burns. The dosage was administered either in one 4 ml dose on the fifth day after the animals were burned or in a series of 3 consecutive 1-ml doses on the fourth, fifth and sixth days after the burns were induced. The control group was administered a saline solution in a similar manner. One group of animals was killed 24 hours after they were burned, and the rest on the seventh day of the experiment. It was found that the clustering and colony-forming abilities of the bone-marrow monocytes were significantly higher in the animals killed 24 hours after they were burned and in the animals treated with the autologous plasma than in the animals in the control group. The elevated activity of myelopoiesis modulators and the consequent activation of clustering and colony-forming ability in the first 24-hour period is a natural reaction to thermal trauma that stimulates myelopoiesis and the formation of a peripheral defensive barrier. It can be presumed that it is during this period that the necessary proportion of various factors, rather than just one in particular, is maintained in the plasma. It was concluded that administering autologous plasma extracted during the first 24 hours after an organism is burned in a series of doses over an extended period of time is probably the most effective way to combat myelopoiesis suppression during burn-induced toxemia. References 9: 2 Russian, 7 Western.

Erythrocyte Membrane Permeability in Peripheral Blood During Exposure to a Low-Frequency Variable Electromagnetic Field

947C0311B Moscow PATOLOGICHESKAYA FIZIOLOGIYA I EKSPERIMENTALNAYA TERAPIYA in Russian No 1, Jan-Mar 1994 pp 17-19

[Article by I. V. Levshin, Department of the Physiology of Underwater Navigation, Prof. L. G. Medvedev, Dept. Chair, of the Military Medical Academy imeni S. M. Kirov, St. Petersburg; UDC 616.155.1-018.1:576.314]-02:615.847.8]-092.9]

[FBIS Abstract] The primary reactions of an organism to exposure to a low-frequency variable magnetic field were studied by determining lipid peroxidic oxidation (LPO) intensity in blood serum and erythrocyte membrane permeability in peripheral blood. During the first stage of the study, 102 male Wistar rats were exposed to a variable magnetic field of 15 or 20 mTl and a pulse duration of 1, 3, or 5 s generated by a specially made device. The rats were then anesthetized, decapitated, and their blood collected. LPO intensity was estimated from the concentration of dienic conjugates in the unsaturated fatty acids and from the quantity of malonic dialdehyde. It was found that one-time exposure induced substantial increases in all indicators of LPO activity, depending on the length and intensity of exposure. Consequently, the second stage of the study focused on the stability of erythrocyte membranes in human blood during prolonged exposure. Blood was drawn from the ulnar vein of 16 healthy human males aged 19-25 who had been exposed to an electromagnetic field of up to 6×10^{-4} mTl for 1.5 to 3 years while at sea. Total peroxidase activity (TPA), chemiluminescence, and the concentration of extraerythrocytic hemoglobin were measured. TPA was 80% higher and chemiluminescence amplitude was 2.4-fold higher than in the control group, which underwent minimal exposure for the same duration while at sea. No significant difference in extraerythrocytic hemoglobin was detected. It was concluded that both one-time and prolonged exposure to a low-frequency variable electromagnetic field intensifies free-radical processes and thus induces an increase in erythrocyte membrane permeability. Figures 1, tables 1; references 13: 11 Russian, 2 Western.

Thrombin-Induced Thrombocyte Aggregation in the Presence of Negatively Charged Liposomes

947C0311C Moscow PATOLOGICHESKAYA FIZIOLOGIYA I EKSPERIMENTALNAYA TERAPIYA in Russian No 1, Jan-Mar 1994 pp 19-20

[Article by V. I. Zakrevskiy, Department of Biological Chemistry of the Volgograd Medical Institute, Prof. Yu. V. Galiyev, Dept. Chair, and A. A. Kubatiyev, Head of the Department of General Pathology and Pathological Physiology of the Central Institute of Physician Training, Moscow; UDC 616.152.002-092:577]

[FBIS Abstract] The effect of negatively charged phospholipids on thrombin-induced thrombocyte aggregation was studied in vitro. Six different liposome preparations were formulated using either phosphatidylserine, dicetylphosphate, or phosphatidylserine as the phospholipid, and either egg-yolk lecithin to make liposomes with liquid membranes or dipalmitoylphosphatidylcholine to make them with solid membranes. The thrombocytes were obtained from the blood of adult male Wistar rats. Thrombocyte aggregation, which was induced by Chrono-log (U.S.) thrombin, was measured at 37°C on a Labor ARAST two-channel aggregometer (Germany) run at 1,000 rpm. It was found that liposome modulation of thrombocyte response to thrombin is not determined by the negative charge of the membrane, but rather by its chemical composition. None of the preparations had any effect on thrombocyte function except for the "liquid" liposome made with phosphatidylserine and cholesterol in a 4:4:2 molar concentration. This preparation exhibited a strong relationship between dosage and thrombocyte aggregation. The effect was said to depend on the temperature of the phase transfer of the phospholipids constituting the liposome membrane to cells. Tables 1; references 7: 1 Russian, 6 Western.

Effectiveness of Using Ovosorb, a Biospecific Antiproteinase Hemosorbent, in the Treatment of Diffuse Peritonitis and Acute Destructive Pancreatitis in Dogs

947C0311D Moscow PATOLOGICHESKAYA FIZIOLOGIYA I EKSPERIMENTALNAYA TERAPIYA in Russian No 1, Jan-Mar 1994 pp 47-49

[Article by N. Ye. Philipovich, V. V. Kirkovskiy, O. F. Antiperovich, S. B. Sinilo, G. A. Lobacheva, and V. M. Moin; Laboratory of Hemo- and Lymphosorption of the Central Scientific Research Laboratory of Minsk Medical Institute, Belarus; UDC 616.381-002.3-06:616.37-002.1]-085.246.2-036.8]

[FBIS Abstract] The effectiveness of Ovosorb as part of a multiple course of treatment for experimentally induced diffuse peritonitis and acute destructive pancreatitis in dogs was assessed. Peritonitis was induced under general anesthesia by cutting through the appendix, which was ligated at the base, performing deomentization, and sewing the abdominal cavity shut. After 24 h, the abdominal cavity was reopened, the appendix removed, the abdominal cavity sterilized, and infusion and antibiotic therapy begun, with the experimental group receiving Ovosorb via hemosorption. Pancreatitis was induced by introducing autologous bile into the main duct of the pancreas until the tissue turned a uniformly intense golden-brown, ligating the organ, and sewing the abdomen shut. A therapy similar to that used for the peritonitis group was then begun. It was found that using Ovosorb to help treat these forms of peritonitis and pancreatitis promoted the rapid normalization of the balance in the proteinase-inhibitor

system. All the animals in the control group began to recover within 36-72 h after treatment began, while those in the experimental group began to show signs of recovery as soon as hemosorption therapy was started. The therapeutic effect of Ovosorb was attributed primarily to the elimination of endotoxins from the

blood and, consequently, the arrest of the processes of protein decay and formation and accumulation of protein catabolism products in the extracellular fluid. Animal deaths were significantly reduced by the Ovosorb treatment. Tables 2; references 18: 13 Russian, 5 Western.

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